REMARKS

In complete response to the outstanding Official Action of March 10, 2004, on the above-identified application, reconsideration is respectfully requested. Claims 1-26 are pending in the application. Claims 1-26 are rejected. No claims are currently amended.

Claim Rejections Under 35 U.S.C. § 102:

Claims 1-3, 9, 11, 12, 14, 16, 17-19; and 22-26 stand rejected under 35 U.S.C. § 102 (b) as being anticipated by Plumat (US Patent 2,838,881).

The Examiner notes that:

"Plumat teaches a method for making glass beads by firing an air fuel burner in a shaft furnace to thereby drawing air into the shaft (Fig. 2, ref. no. 4); adding raw material to the furnace (Fig. 10, ref. no. 10, 9); and adding oxidant via a single lance, multiple lances, a lance incorporated in an air fuel burner or an oxidant injection ring (Fig. 2, ref. no. 11,4,6,6'; the ring of air inlets serve as both a single lance, multiple lances, or an oxidant injection ring. Also, the side air pods 6 and 6' for the burner serve as oxidant injection lances within an air burner)....."

The Examiner further notes that:

"Plumat also teaches that oxidant is injected upward along the center of the furnace (Fig. 2, ref. no. 11,1)."

The Examiner further notes that:

"Plumat also teaches that the lances are at an angle to the vertical axis of the furnace (Fig. 2, ref. no. 11 and 1)."

The Examiner further notes that:

"Plumat also teaches that the oxidant ring has a ratio to the furnace diameter of 0.2 to 0.9 (Fig. 2, ref. no. 11, 1)."

The Examiner further notes that:

"Plumat also teaches the claimed apparatus. Plumat's respective teachings with regard to the apparatus claims are as noted above with respect to the corresponding method claims."

Applicants respectfully contend that the present invention is not anticipated by Plumat (US Patent 2,838,881).

Plumat (US Patent 2,838,881) discloses a process for the **preheating of glass granules** by **dispersing the granules** in an air stream already preheated to a temperature slightly above the softening glass.

Plumat further discloses **a ring of nozzles** (Fig. 2 ref. no. 11) through which cold air is blown **at a higher level,** and around a glass feeding **air-fuel burner** (column 4, lines 29-30 and column 5, lines 18-24). Glass is fed to the furnace through the air-fuel burner. (column 1, lines 32-36). The cold air fed above the air-fuel burner contributes to a relatively **cold gas current** immediately **after the beads are formed,** so that they are not able to adhere to one another (column 4, lines 35-39). The nozzles are a separate element and clearly not incorporated in the air-fuel burner.

Plumat further discloses a **pipe line** (Fig. 2 ref. no. 4) through which a **burner receives fuel gas** (column 4, lines 49-50). Clearly, the pipe line (Fig. 2 ref. no. 4) does not carry an oxidant.

Plumat further discloses a **double pipe system** (Fig. 2 ref. no. 6, 6') **connected to** the double pipe system of **the burner** (column 4, lines 57-58). The double pipe system (Fig. 2 ref. no. 6, 6') is clearly not incorporated into the burner. Furthermore, the double pipe system of the burner (Fig. 2, ref. no. 35) delivers air and glass particles to the outer portion of the burner while the fuel

gas pipe line delivers fuel to the center of the burner, and thus, the air is supplied to the outer portion of the flame while the fuel is delivered to the center portion of the flame (Fig. 2, ref. no. 4).

In contrast, the present invention claims a process and apparatus for improving the production capacity of spheroidal glass particles of a vertical glass furnace, while retaining the glass bead quality. The glass quality in most glass spherodizing processes is adversely affected by exceeding the **production capacity** and the production capacity is directly **proportional** to the **flame temperature** (page 3, paragraphs 0009 and 0010). This improvement in both capacity and quality is accomplished in the manners described below.

The process claimed in the present invention **introduces an oxygen jet** at a very high velocity, adjacent to the bottom opening in the furnace using a single lance in the center and **upstream of the air-fuel burners** (page 6, paragraphs 0027, 0031). A particularly preferred injection location is between about 2 to 12 feet below the air-fuel burners (page 8, paragraph 0033). Furthermore, this jet does not carry glass particles (Fig. 2, no. 202). This high velocity injection creates an ejector effect that **entrains a very large amount of ambient air**, which together with the oxidant **increase the flame temperature** and faster spheroidization process (page 6, paragraph 27).

The present invention also claims operating an **oxy-fuel burner** that is **in addition to,** and **upstream of the air-fuel burner,** and is located adjacent to the shaft bottom (page 9, paragraph 0036 and Fig. 3). This oxy-fuel burner does not carry glass particles (Fig. 3, no. 302). The flame provides **additional heat** for the spheroidization process (page 9, paragraph 0037).

The present invention also claims **injecting oxidant** at low velocity using multiple lances upstream, and thus **below the air-fuel burners** (page 10,

paragraph 0039). The oxidant mixes with the entrained air enriching the oxidant content and **increasing the flame temperature** and thus the production capacity (page 10, paragraph 0040).

The present invention also claims injecting oxidant into the shaft using a lance, incorporated into the air-fuel burner. The lance feeds oxidant **through the center of the air-fuel burner** directly into the **center of the air-fuel flame,** from the originating point of the flame, to **increase the flame temperature** (page 11, paragraph 42 and Fig. 8 no. 502).

The present invention also claims injecting oxidant into the shaft using a ring positioned adjacent to the shaft bottom. The ring injects oxidant **below the air-fuel burners** allowing the oxidant to **mix with the entrained air** before the entrained air contacts the oxy-fuel flame, thus **increasing the flame temperature** (page 11, paragraph 0043 and Fig. 9, nos. 602, 112, and F_{OF}).

Hence, the present invention as claimed in Claims 1-3, 9, 11, 12, 14, 16, 17-19, and 22-26 are not anticipated by Plumat (US Patent 2,838,881).

Claims 17-18, 22 and 25-26 stand rejected under 35 U.S.C. § 102 (b) as being anticipated by Palmer (US Patent 2,958,161).

The Examiner notes that:

"Palmer teaches a vertical glass furnace having an shaft with an interior space open at the bottom (Fig. 1, ref no. 12, the fact that glass is pouring out of the cylinder 12 means that the cylinder is "open"); an air fuel burner (Fig. 1, ref no. 59,60,61); a raw material addition device (Fig. 1, ref no. P, 17, 18, 19, 31, 20); and an oxidant addition element including a single lance, multiple lances and an oxidant ring....."

The Examiner further notes that:

"Palmer also teaches that the that the ratio of the outer diameter of the oxidant ring to an

interior diameter of the furnace is 0.2-0.9....."

Applicants respectfully contend that the present invention is not anticipated by Palmer (US Patent 2,958,161).

Palmer (US Patent 2,958,161) discloses a glass melting furnace comprising a **closed chamber** operating **under pressure,** wherein **molten glass** is withdrawn through a port in the bottom of the chamber (column 1, lines 34-43, column 4, lines 4-6 and Fig. 1, no. 56). Clearly, atmospheric **air cannot flow up through the discharge port,** because the chamber is under pressure and molten glass is covering and flowing down through the port.

Palmer further discloses vertically spaced **burners extending through the walls** of the melting furnace (column 4, lines 7-9). The only oxidant feed disclosed by Palmer is feeding **oxygen under pressure** near the lower end through a pipe (column 4, lines 19-21 and Fig., no. 1, 62). Clearly, there are no burners adjacent to the bottom of the furnace, and no air enters through an open bottom of the furnace.

In contrast, the present invention claims a vertical furnace for the production of glass beads (page 3, paragraph 0011). The vertical furnace has an **open bottom** to **allow air to be entrained** into the shaft through the open bottom, and thus, does not operate at pressure (page 3, paragraph 0011). The **output** of the furnace is individual **glass beads** as opposed to molten glass.

The furnace in the present invention further comprises a lance in the center of the bottom opening in the furnace to **introduce an oxidant** at a very high velocity **upstream of the air-fuel burners** (page 6, paragraphs 0027, 0031). A particularly preferred injection location is between about 2 to 12 feet below the air-fuel burners (page 8, paragraph 0033). Furthermore, this jet does

not carry glass particles (Fig. 2, no. 202). This high velocity injection creates an ejector effect, **entrains a very large amount of ambient air**, which together with the oxidant, creates **higher flame temperature** and faster spheroidization process (page 6, paragraph 0027).

The present invention further claims an **oxy-fuel burner** that is in **addition to** and **upstream** of the air-fuel burners and is located adjacent to the open shaft bottom (page 9, paragraph 0036 and Fig. 3). The flame provides **additional heat** for the spheroidization process (page 9, paragraph 0037).

The present invention also claims multiple lances for **injecting oxidant** at low velocity (e.g. between 1 ft/s and 100 ft/s) **upstream of the air-fuel burners** in the furnace (pages 10-11, paragraphs 0039-40). The oxidant **mixes with the entrained air,** enriching the oxidant content in the entrained air from 21.5% up to 60% and **increasing the flame temperature** (pages 10-11, paragraphs 0039-40). Clearly, the claimed furnace **requires an open bottom** that allows **significant quantities of atmospheric air to enter** the furnace.

The present invention also claims a lance incorporated into the air-fuel burner for injecting oxidant into the air-fuel flame. The lance passes through the **center of the air-fuel burner** and injects oxidant directly into the center of the air-fuel flame from the originating point of the flame to increase the temperature of the flame (page 11, paragraph 0042 and Fig. 8 no. 502).

The present invention also claims a ring positioned adjacent to the shaft bottom to inject oxidant into the shaft. The **ring** is clearly **below the air-fuel burners,** allowing the oxidant to **mix with the entrained air** before the entrained air contacts the oxy-fuel flame (page 11, paragraph 0043 and Fig. 9, nos. 602, 112, F_{OF}).

Hence, the present invention as claimed in Claims 17-18, 22 and 25-26 are not anticipated by Palmer (US Patent 2,958,161).

Claim Rejections Under 35 U.S.C. § 103:

Claim 4 stands rejected under 35 U.S.C. § 103 (a) as being unpatentable over Plumat US Patent 2,838,881 in view of Potter US Patent 2,619,776.

The Examiner notes that:

"Plumat teaches applicant's claimed invention except for the claimed equivalence ratio. Potters teaches that it is known to use an equivalence ratio of 1.0 ..... It would have been prima facie obvious at the time the invention was made to combine Potters' equivalence ratio with Plumat's method of making glass beads because doing so would prevent carbon formation....."

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2,838,881) and in further view of Potter (US Patent 2,619,776).

Plumat teaches an air-fuel burner near the bottom of the chamber, wherein, particles of glass and air are fed into the area around the flame of the burner through a double pipe burner (column 1, lines 32-37, and Fig. 2 no. 3, 35). Similarly, Potter teaches an air-fuel burner near the bottom of a draft tube wherein, particles of glass are fed into the gas stream passing through the burner (column 3, lines 17-23).

The process of claim 4 uses an **oxygen jet at a very high velocity** from the bottom opening in the furnace, **upstream of the air-fuel burner,** to create an ejector effect, thus entraining more air into the furnace (page 6, paragraphs 0027, 0031). Neither Plumat nor Potter teaches **injecting oxidant** at a high velocity **upstream of the air-fuel burner** to create an ejector effect. Nor does

any combination of the teachings contained in Plumat and Potter suggest adding an injector upstream of the air-fuel burners to provide air to the process.

Hence, one of ordinary skill in the art would not find that Plumat, (US Patent 2838881) in view of Potter, (US Patent 2,619,776) either teaches or suggests, to one skilled in the art, the present invention as claimed in Claim 4.

Claims 5, 10, 13 and 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Plumat (US Patent 2,838,881).

The Examiner notes that:

"Plumat teaches applicant's claimed invention except for the claimed oxidant velocities. Plumat does teach that it is known to control the velocity of the issuing air (oxidant) to control the suspension of the beads in the furnace (col. 5, lines 65-70, col. 6, lines 13-17). It would have been prima facie obvious at the time the invention was made to use the claimed velocities for the oxidant with Plumat's method of making glass beads because Plumat teaches that it is known to control the velocity to achieve the desired bead suspension and solidification."

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2,838,881).

Plumat (US Patent 2,838,881) teaches an air-fuel burner near the bottom of the chamber, wherein particles of glass and air are fed into the area around the flame of the burner through a double pipe burner (column 1, lines 32-37, and Fig. 2 no. 3, 35).

The process of claim 5 uses an **oxygen jet** at a very high velocity from the bottom opening in the furnace, using a single lance in the center, and **upstream of the air-fuel burner** (page 6, paragraphs 0027, 0031). The claimed velocity of the oxygen jet is between 500 ft/s and 800 ft/s (page 8, paragraph 0033). Plumat

does not teach or suggest injecting oxidant at a high velocity upstream of the air-fuel burner to create an ejector effect, and one skilled in the art did not know at the time of the invention, to use a high velocity injector lance upstream of the air-fuel burner to increase the flame temperature.

The process of claim 10 **injects oxidant** at low velocity using multiple lances upstream, and thus **below the air-fuel burners** into which glass is injected (page 10, paragraph 0039). Because Plumat **does not teach or suggest** injecting oxidant at low velocity using multiple lances upstream of the air-fuel burners and one skilled in the art did not know at the time of the invention to inject oxidant at low velocity using multiple lances upstream of the air-fuel burners to increase the flame temperature.

The process of claim 13 **injects oxidant** into the shaft using a lance incorporated into the air-fuel burner. The lance feeds oxidant through the **center of the air-fuel burner** directly into the center of the air-fuel flame from the originating point of the flame, to increase the temperature of the flame (page 11, paragraph 0042 and Fig. 8 no. 502). Because Plumat **does not teach or suggest** injecting oxidant through the center of the air-fuel burner and one skilled in the art did not know at the time of the invention to inject oxidant through the center of the air-fuel burner to raise flame temperature.

The process of claim 15 **injects oxidant** into the shaft **below the air-fuel burners** allowing the oxidant to mix with the entrained air before the entrained air contacts the oxy-fuel flame (page 11, paragraph 0043 and Fig. 9). Because Plumat **does not teach or suggest** injecting oxidant through a ring below the air-fuel burner, and one skilled in the art did not know at the time of the invention, to inject oxidant through a ring below the air-fuel burner to raise the flame temperature.

Hence, one of ordinary skill in the art would not find that Plumat (US Patent 2,838,881) either teaches or suggests to one skilled in the art the present invention as claimed in Claims 5, 10, 13 and 15.

Claims 6-8 and 20-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Plumat (US Patent 2,838,881) in view of Brahmbhatt et al. (US Patent 5,611,833).

The Examiner notes that:

"Plumat teaches applicant's claimed invention except for using an oxy-fuel burner or the claimed flame stoichiometry. Brahmbhatt et al. teach that it is well known in the glass bead forming art to use an oxy-fuel flame (Fig. 1, ref. no. 11). Brahmbhatt et al. also teach that it is important to have flame stoichiometry of 2:1 which is within applicant's claimed range (col. 5 lines 10-16). Also, Brahmbhatt et al. teaches that the burner is directed upwardly in the shaft (Fig. 1 , ref. no. 11) as does Plumat (Fig. 2, ref. no. 4)."

The Examiner further notes that:

"It would have been prima facie obvious at the time the invention was made to combine Brahmbhatt et al. 's oxyfuel burner and stoichiometry with Plumat's method of and apparatus for making glass beads....."

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2838881) and in further view of Brahmbhatt et al. (US Patent 5,611,833).

Brahmbhatt discloses a glass melting furnace comprising **an air-fuel burner** near the bottom of the chamber, **wherein air and particles of glass are fed** into the flame of the burner through a conduit attached to the burner (column 3, lines 44-47, column 4. lines 3-5, and Fig. no. 7,11). Likewise, Plumat teaches **an air-fuel burner** near the bottom of the chamber, **wherein air and particles of glass are fed** into the area around the flame of the burner through a double pipe burner (column 1, lines 32-37, and Fig. 2 no. 3, 35).

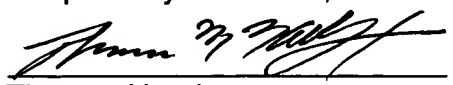
The process and apparatus of claims 6,7,8, 20 and 21 comprise a **supplemental oxy-fuel burner** that is in addition to, and **upstream of the air-fuel burner,** and is located adjacent to the shaft bottom (page 9, paragraph 0036 and Fig. 3). **Glass is not fed** to the oxy-fuel burner (Fig. 3, no. 302). The flame provides **additional heat** for the spheroidization process (page 9, paragraph 0037). Neither Plumat nor Brahmbhatt teach adding a supplemental burner upstream of the air-fuel burners to provide addition heat to the process. Nor does any combination of the teachings contained in Plumat and Brahmbhatt suggest adding a supplemental burner upstream of the air-fuel burners to provide addition heat to the process.

Hence, one of ordinary skill in the art would not find that Plumat (US Patent 2838881) in view of Brahmbhatt et al. (US Patent 5611833) either teaches or suggests to one skilled in the art the present invention as claimed in Claims 6-8 and 20-21.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the examiner believe a telephone call would expedite the prosecution of the application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,



Thomas Hendryx
Registration No. 54,934

Date: May 10, 2004
Air Liquide
2700 Post Oak Blvd., Suite 1800
Houston, Texas 77056
(713) 624-8956 Phone (713) 624-8950 Fax

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Stacy Forte